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EXAMINER	
TORRES, JUAN A	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/865,409	Applicant(s) MCCUNE, EARL W.	
	Examiner Juan A. Torres	Art Unit 2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 September 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,4-8 and 11-20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-8 and 11-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

Applicant's arguments with respect to claims 1, 4-8, 11-13 and 15-19 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 4-8, 15-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nash (US 6317589 B1) in view of Black (US 3769580 A).

As per claim 1, Nash discloses a method of receiving a communications signal to produce two output signals in quadrature relation to one another, comprising deriving two reference signals from a single clock signal (figure 3 block 112, column 3 line 55); using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 3 blocks 106 and 108, column 3 line 53-54); forming an error signal representing the expectation of the product of the two output signals (figure 3 block 316, column 4 line 8-15); and using the error signal to adjust a phase difference between the reference signals (figure 3 blocks 322, 324 and 314, column 2 line 15-22). Nash doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Black discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 1

and 2 column 1 line 53 to column 3 line 24). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 1.

As per claim 4 Nash and Black discloses claim 1. Black also inherently discloses the use of a fix delay line (figure 3 blocks 322, 324 and 314, column 2 line 15-22). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 4.

As per claim 5 Nash and Black discloses claim 1. Black also discloses the use of a dual delay line to automatically adjust the phase in a receiver (figure 3 blocks 322,

324 and 314, column 2 line 15-22). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 5.

As per claim 6, Nash discloses a receiver for receiving a communications signal to produce two output signals in quadrature relation to one another, comprising a local oscillator (figure 3 block 212, column 3 line 55); an adjustable phase shift network for deriving two reference signals from the local oscillator (figure 3 block 314, column 3 line 58-60); means for, using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 3 blocks 106 and 308, column 3 line 53-54); and a phase error detection network for forming an error signal representing the expectation of the product of the two output signals (figure 3 block 316, column 4 line 8-15). Nash doesn't disclose using an adjustable dual delay line to adjust a relative delay between two signals. Black discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 1 and 2 column 1 line 53 to column 3 line 24). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the

phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 6.

As per claim 7, Nash discloses claim 6. Nash also discloses that the phase error detection network comprises a multiplier for multiplying the two output signals to form a product signal (figure 3 block 320, column 4 line 10-13). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 7.

As per claim 8, Nash discloses claim 7. Nash also discloses that the phase error detection network comprises a low-pass filter for filtering the product signal to thereby

produce the error signal (figure 3 block 322, column 4 line 17-19). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 8.

As per claim 15, Nash discloses an apparatus comprising a phase error detection network configured to receive in-phase (I) and quadrature-phase (Q) signals (figure 3 column 2line 58 to column 4 line 57), the phase error detection network including an error signal generator (figure 3 column 2line 58 to column 4 line 57); and a local oscillator signal that is configured to receive an error signal from the error signal generator and generate I and Q reference signals having a relative delay that is dependent on the error signal (figure 3 blocks 322, 324 and 314, column 2 line 15-22. A phase difference in the frequency domain is equilent to a delay n the time domain. A pahe difference of 90 degree is a local oscillator is equivalent to delay the signal T/4, where T is the period of the signal or 1/4*fo, where fo is the frequency of the local oscilator). Nash doesn't disclose using a dual delay line in order to alter relative delay between two signals. Black discloses using an adjustable dual delay line in order to alter

relative delay between two signals (figures 1 and 2 column 1 line 53 to column 3 line 24). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 15.

As per claim 16, Nash and Black disclose claim 15. Nash also discloses a downconverter configured to receive a signal to be downconverted and having reference signal inputs configured to receive the I and Q reference signals (figure 3 blocks 110 and 308 column 2line 58 to column 4 line 57). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore,

it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 16.

As per claim 17, Nash and Black disclose claim 16. Nash also discloses that the downconverter comprises I and Q mixers. (figure 3 blocks 110 and 308 column 2line 58 to column 4 line 57). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Black column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 17.

As per claim 20, Nash discloses a mixing an in-phase (I) component of a communications signal received at an RF input port of an I-channel mixer with an in-phase reference signal received at a reference input of said I-channel mixer (figure 3 block 110 column 3 line 38 to column 4 line 51); mixing a quadrature (Q) component of said communications signal received at an RF input of a Q-channel mixer with a quadrature reference signal received at a reference input of said Q-channel mixer (figure 3 block 308 column 3 line 38 to column 4 line 51); generating an error signal from I-channel and Q-channel outputs of said I-channel and Q-channel mixers (figure 3 block 316 column 3 line 38 to column 4 line 51); and based on a value of the generated

error signal, adjusting a relative delay between said in-phase and quadrature reference signals results in quadrature alignment of said in-phase and quadrature components of said communications signal (figure 3 block 314 column 3 line 38 to column 4 line 51. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc). Nash doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Black discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 1 and 2 column 1 line 53 to column 3 line 24). Nash and Black are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Black. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Black abstract). Therefore, it would have been obvious to combine Nash with Black to obtain the invention as specified in claim 20.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nash and Black as applied to claim 6 above in view of Kumar (US 5835850). Nash and Black disclose claim 6. Nash and Black don't disclose the use of Gilbert-cell mixers for performing frequency down-conversion. Kumar discloses the use of Gilbert-cell mixer to make frequency down-conversions in a receiver (column 5 lines 13-16). Nash and Kumar are analogous art because they are from the same field of endeavor. At the time

of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash and Black the Gilbert-cell mixer disclosed by Kumar. The suggestion/motivation for doing so would have been to use a low noise high intercept input mixer (Kumar column 5 lines 6-22). Therefore, it would have been obvious to combine Nash and Black with Kumar to obtain the invention as specified in claim 11.

Claims 12 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nash and Black as applied to claim 6 above in view of Hislop (US 4492960).

As per claim 12 Nash and Black disclose claim 6. Nash and Black don't disclose the use of switch-mode mixers for performing frequency down-conversion. Hislop discloses the use of switch-mode mixers convert make frequency down-conversions in a receiver (figure 1 column 2 lines 4-46). Nash and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash and Black with the switch-mode mixers disclosed by Hislop. The suggestion/motivation for doing so would have been to allow the local oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine Nash and Black with Hislop to obtain the invention as specified in claim 12.

As per claim 18 Nash and Black disclose claim 15. Nash and Black don't disclose a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals

from said switch driver. Hislop discloses a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals from said switch driver (figure 1 column 2 lines 4-46). Nash and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash and Black with the switch-mode mixers disclosed by Hislop. The suggestion/motivation for doing so would have been to allow the local oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine Nash and Black with Hislop to obtain the invention as specified in claim 18.

Claims 13 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nash, Black and Hislop as applied to claims 12 and 18 above and further in view of Hulkko (US 5734683).

As per claim 13 Nash, Black and Hislop disclose claim 12. Nash, Black and Hislop don't disclose the use of local oscillator with a frequency that is a sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Nash, Hislop and Hukko are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash, Black and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the

design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine Nash, Black, Hislop with Hukko to obtain the invention as specified in claim 13.

As per claim 19 Nash, Black and Hislop disclose claim 18. Nash, Black and Hislop don't disclose the use of local oscillators with a frequency that is a sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Nash, Hislop and Hukko are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash, Black and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine Nash, Black, Hislop with Hukko to obtain the invention as specified in claim 19.

Claims 1, 4-8, 15-18 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nash (US 6317589 B1) in view of Hamamoto (US 6417715 B2).

As per claim 1, Nash discloses a method of receiving a communications signal to produce two output signals in quadrature relation to one another, comprising deriving two reference signals from a single clock signal (figure 3 block 112, column 3 line 55); using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 3 blocks 106 and 108,

column 3 line 53-54); forming an error signal representing the expectation of the product of the two output signals (figure 3 block 316, column 4 line 8-15); and using the error signal to adjust a phase difference between the reference signals (figure 3 blocks 322, 324 and 314, column 2 line 15-22). Nash doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 1.

As per claim 4 Nash and Hamamoto discloses claim 1. Hamamoto also inherently discloses the use of a fix delay line (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62 disabling the control). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the

art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 4.

As per claim 5 Nash and Hamamoto discloses claim 1. Hamamoto also discloses the use of a dual delay line to automatically adjust the phase in a receiver (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 5.

As per claim 6, Nash discloses a receiver for receiving a communications signal to produce two output signals in quadrature relation to one another, comprising a local oscillator (figure 3 block 212, column 3 line 55); an adjustable phase shift network for deriving two reference signals from the local oscillator (figure 3 block 314, column 3 line 58-60); means for, using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 3 blocks 106 and 308, column 3 line 53-54); and a phase error detection network for

forming an error signal representing the expectation of the product of the two output signals (figure 3 block 316, column 4 line 8-15). Nash doesn't disclose using an adjustable dual delay line to adjust a relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 6.

As per claim 7, Nash discloses claim 6. Nash also discloses that the phase error detection network comprises a multiplier for multiplying the two output signals to form a product signal (figure 3 block 320, column 4 line 10-13). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The

suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 7.

As per claim 8, Nash discloses claim 7. Nash also discloses that the phase error detection network comprises a low-pass filter for filtering the product signal to thereby produce the error signal (figure 3 block 322, column 4 line 17-19). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 8.

As per claim 15, Nash discloses an apparatus comprising a phase error detection network configured to receive in-phase (I) and quadrature-phase (Q) signals (figure 3 column 2line 58 to column 4 line 57), the phase error detection network including an error signal generator (figure 3 column 2line 58 to column 4 line 57); and a local oscillator signal that is configured to receive an error signal from the error signal generator and generate I and Q reference signals having a relative delay that is dependent on the error signal (figure 3 blocks 322, 324 and 314, column 2 line 15-22. A phase difference in the frequency domain is equivalent to a delay n the time domain. A

phase difference of 90 degree is a local oscillator is equivalent to delay the signal T/4, where T is the period of the signal or 1/4*fo, where fo is the frequency of the local oscillator). Nash doesn't disclose using a dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 15.

As per claim 16, Nash and Hamamoto disclose claim 15. Nash also discloses a down converter configured to receive a signal to be down converter and having reference signal inputs configured to receive the I and Q reference signals (figure 3 blocks 110 and 308 column 2line 58 to column 4 line 57). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the

invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 16.

As per claim 17, Nash and Hamamoto disclose claim 16. Nash also discloses that the down converter comprises I and Q mixers. (figure 3 blocks 110 and 308 column 2line 58 to column 4 line 57). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 17.

As per claim 20, Nash discloses a mixing an in-phase (I) component of a communications signal received at an RF input port of an I-channel mixer with an in-phase reference signal received at a reference input of said I-channel mixer (figure 3 block 110 column 3 line 38 to column 4 line 51); mixing a quadrature (Q) component of

said communications signal received at an RF input of a Q-channel mixer with a quadrature reference signal received at a reference input of said Q-channel mixer (figure 3 block 308 column 3 line 38 to column 4 line 51); generating an error signal from I-channel and Q-channel outputs of said I-channel and Q-channel mixers (figure 3 block 316 column 3 line 38 to column 4 line 51); and based on a value of the generated error signal, adjusting a relative delay between said in-phase and quadrature reference signals results in quadrature alignment of said in-phase and quadrature components of said communications signal (figure 3 block 314 column 3 line 38 to column 4 line 51. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc). Nash doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Nash and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Nash the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Nash with Hamamoto to obtain the invention as specified in claim 20.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Nash and Hamamoto as applied to claim 6 above in view of Kumar (US 5835850). Nash and Hamamoto disclose claim 6. Nash and Hamamoto don't disclose the use of Gilbert-cell mixers for performing frequency down-conversion. Kumar discloses the use of Gilbert-cell mixer to make frequency down-conversions in a receiver (column 5 lines 13-16). Nash and Kumar are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash and Hamamoto the Gilbert-cell mixer disclosed by Kumar. The suggestion/motivation for doing so would have been to use a low noise high intercept input mixer (Kumar column 5 lines 6-22). Therefore, it would have been obvious to combine Nash and Hamamoto with Kumar to obtain the invention as specified in claim 11.

Claims 12 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nash and Hamamoto as applied to claim 6 above in view of Hislop (US 4492960).

As per claim 12 Nash and Hamamoto disclose claim 6. Nash and Hamamoto don't disclose the use of switch-mode mixers for performing frequency down-conversion. Hislop discloses the use of switch-mode mixers convert make frequency down-conversions in a receiver (figure 1 column 2 lines 4-46). Nash and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash and Hamamoto with the switch-mode mixers disclosed by Hislop. The suggestion/motivation for doing so would have been to allow the local

oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine Nash and Hamamoto with Hislop to obtain the invention as specified in claim 12.

As per claim 18 Nash and Hamamoto disclose claim 15. Nash and Hamamoto don't disclose a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals from said switch driver. Hislop discloses a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals from said switch driver (figure 1 column 2 lines 4-46). Nash and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash and Hamamoto with the switch-mode mixers disclosed by Hislop. The suggestion/motivation for doing so would have been to allow the local oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine Nash and Hamamoto with Hislop to obtain the invention as specified in claim 18.

Claims 13 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nash, Hamamoto and Hislop as applied to claims 12 and 18 above and further in view of Hulkko (US 5734683).

As per claim 13 Nash, Hamamoto and Hislop disclose claim 12. Nash, Hamamoto and Hislop don't disclose the use of local oscillator with a frequency that is a

sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Nash, Hislop and Hukko are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash, Hamamoto and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine Nash, Hamamoto, Hislop with Hukko to obtain the invention as specified in claim 13.

As per claim 19 Nash, Hamamoto and Hislop disclose claim 18. Nash, Hamamoto and Hislop don't disclose the use of local oscillators with a frequency that is a sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Nash, Hislop and Hukko are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Nash, Hamamoto and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine Nash, Hamamoto, Hislop with Hukko to obtain the invention as specified in claim 19.

Claims 1, 4-6, 15-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art in view of Hamamoto (US 6417715 B2).

As per claim 1, admitted prior art discloses a method of receiving a communications signal to produce two output signals in quadrature relation to one another, comprising deriving two reference signals from a single clock signal (figure 1 block 16); using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 1 blocks 10 and12); forming an error signal representing the expectation of the product of the two output signals (figure 1 block 18); and using the error signal to adjust a phase difference between the reference signals (figure 1 block 16). Admitted prior art doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 1.

As per claim 4 admitted prior art and Hamamoto discloses claim 1. Hamamoto also inherently discloses the use of a fix delay line (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62 disabling the control). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 4.

As per claim 5 admitted prior art and Hamamoto discloses claim 1. Hamamoto also discloses the use of a dual delay line to automatically adjust the phase in a receiver (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract).

Therefore, it would have been obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 5.

As per claim 6, admitted prior art discloses a receiver for receiving a communications signal to produce two output signals in quadrature relation to one another, comprising a local oscillator (figure 1 block 14); an adjustable phase shift network for deriving two reference signals from the local oscillator (figure 1 block 16); means for, using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 1 blocks 10 and 12); and a phase error detection network for forming an error signal representing the expectation of the product of the two output signals (figure 1 block 18). Admitted prior art doesn't disclose using an adjustable dual delay line to adjust a relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been

obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 6.

As per claim 15, admitted prior art discloses an apparatus comprising a phase error detection network configured to receive in-phase (I) and quadrature-phase (Q) signals (figure 1), the phase error detection network including an error signal generator (figure 1 Block 18); and a local oscillator signal that is configured to receive an error signal from the error signal generator and generate I and Q reference signals having a relative delay that is dependent on the error signal (figure 1 Block 16). Admitted prior art doesn't disclose using a dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 15.

As per claim 16, admitted prior art and Hamamoto disclose claim 15. Admitted prior art also discloses a down converter configured to receive a signal to be down converter and having reference signal inputs configured to receive the I and Q reference signals (figure 1 blocks 10 and 12). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 16.

As per claim 17, admitted prior art and Hamamoto disclose claim 16. Admitted prior art also discloses that the down converter comprises I and Q mixers. (figure 1 Blocks 10 and 12). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the

dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 17.

As per claim 20, admitted prior art discloses a mixing an in-phase (I) component of a communications signal received at an RF input port of an I-channel mixer with an in-phase reference signal received at a reference input of said I-channel mixer (figure 1 Block 10); mixing a quadrature (Q) component of said communications signal received at an RF input of a Q-channel mixer with a quadrature reference signal received at a reference input of said Q-channel mixer (figure 1 Block 12); generating an error signal from I-channel and Q-channel outputs of said I-channel and Q-channel mixers (figure 1 Block 18); and based on a value of the generated error signal, adjusting a relative delay between said in-phase and quadrature reference signals results in quadrature alignment of said in-phase and quadrature components of said communications signal ((figure 1 Block 16. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc). Admitted prior art doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Admitted prior art and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the

invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by admitted prior art the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine admitted prior art with Hamamoto to obtain the invention as specified in claim 20.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art and Hamamoto as applied to claim 6 above in view of Kumar (US 5835850). Admitted prior art and Hamamoto disclose claim 6. Admitted prior art and Hamamoto don't disclose the use of Gilbert-cell mixers for performing frequency down-conversion. Kumar discloses the use of Gilbert-cell mixer to make frequency down-conversions in a receiver (column 5 lines 13-16). Admitted prior art and Kumar are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by admitted prior art and Hamamoto the Gilbert-cell mixer disclosed by Kumar. The suggestion/motivation for doing so would have been to use a low noise high intercept input mixer (Kumar column 5 lines 6-22). Therefore, it would have been obvious to combine admitted prior art and Hamamoto with Kumar to obtain the invention as specified in claim 11.

Claims 12 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art and Hamamoto as applied to claim 6 above in view of Hislop (US 4492960).

As per claim 12 admitted prior art and Hamamoto disclose claim 6. Admitted prior art and Hamamoto don't disclose the use of switch-mode mixers for performing frequency down-conversion. Hislop discloses the use of switch-mode mixers convert make frequency down-conversions in a receiver (figure 1 column 2 lines 4-46). Admitted prior art and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by admitted prior art and Hamamoto with the switch-mode mixers disclosed by Hislop. The suggestion/motivation for doing so would have been to allow the local oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine admitted prior art and Hamamoto with Hislop to obtain the invention as specified in claim 12.

As per claim 18 admitted prior art and Hamamoto disclose claim 15. Admitted prior art and Hamamoto don't disclose a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals from said switch driver. Hislop discloses a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals from said switch driver (figure 1 column 2 lines 4-46). Admitted prior art and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by admitted prior art and Hamamoto with the switch-mode mixers disclosed by Hislop. The

suggestion/motivation for doing so would have been to allow the local oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine admitted prior art and Hamamoto with Hislop to obtain the invention as specified in claim 18.

Claims 13 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over admitted prior art, Hamamoto and Hislop as applied to claims 12 and 18 above and further in view of Hulkko (US 5734683).

As per claim 13 admitted prior art, Hamamoto and Hislop disclose claim 12. Admitted prior art, Hamamoto and Hislop don't disclose the use of local oscillator with a frequency that is a sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Admitted prior art, Hislop and Hukko are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by admitted prior art, Hamamoto and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine admitted prior art, Hamamoto, Hislop with Hukko to obtain the invention as specified in claim 13.

As per claim 19 admitted prior art, Hamamoto and Hislop disclose claim 18. Admitted prior art, Hamamoto and Hislop don't disclose the use of local oscillators with

a frequency that is a sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Admitted prior art, Hislop and Hukko are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by admitted prior art, Hamamoto and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine admitted prior art, Hamamoto, Hislop with Hukko to obtain the invention as specified in claim 19.

Claims 1, 4-6, 15-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beard (US 4475088 A) in view of Hamamoto (US 6417715 B2).

As per claim 1, Beard discloses a method of receiving a communications signal to produce two output signals in quadrature relation to one another, comprising deriving two reference signals from a single clock signal (figure 1 block 16 column 2 line 61 to column 3 line 41); using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 1 blocks 10 and 12 column 2 line 61 to column 3 line 41); forming an error signal representing the expectation of the product of the two output signals (figure 1 block 18 column 2 line 61 to column 3 line 41); and using the error signal to adjust a phase difference between the reference signals (figure 1 block 16 column 2 line 61 to column 3

line 41). Beard doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 1.

As per claim 4 Beard and Hamamoto discloses claim 1. Hamamoto also inherently discloses the use of a fix delay line (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62 disabling the control). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been

obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 4.

As per claim 5 Beard and Hamamoto discloses claim 1. Hamamoto also discloses the use of a dual delay line to automatically adjust the phase in a receiver (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 5.

As per claim 6, Beard discloses a receiver for receiving a communications signal to produce two output signals in quadrature relation to one another, comprising a local oscillator (figure 1 block 14 column 2 line 61 to column 3 line 41); an adjustable phase shift network for deriving two reference signals from the local oscillator (figure 1 block 16 column 2 line 61 to column 3 line 41); means for, using the two reference signals, performing frequency downconversion of the communications signal to produce the two output signals (figure 1 blocks 10 and 12 column 2 line 61 to column 3 line 41); and a phase error detection network for forming an error signal representing the expectation of

the product of the two output signals (figure 1 block 18 column 2 line 61 to column 3 line 41). Beard doesn't disclose using an adjustable dual delay line to adjust a relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 6.

As per claim 15, Beard discloses an apparatus comprising a phase error detection network configured to receive in-phase (I) and quadrature-phase (Q) signals (figure 1 column 2 line 61 to column 3 line 41), the phase error detection network including an error signal generator (figure 1 Block 18 column 2 line 61 to column 3 line 41); and a local oscillator signal that is configured to receive an error signal from the error signal generator and generate I and Q reference signals having a relative delay that is dependent on the error signal (figure 1 Block 16 column 2 line 61 to column 3 line 41). Beard doesn't disclose using a dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order

to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 15.

As per claim 16, Beard and Hamamoto disclose claim 15. Beard also discloses a down converter configured to receive a signal to be down converter and having reference signal inputs configured to receive the I and Q reference signals (figure 1 blocks 10 and 12 column 2 line 61 to column 3 line 41). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7).

Therefore, it would have been obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 16.

As per claim 17, Beard and Hamamoto disclose claim 16. Beard also discloses that the down converter comprises I and Q mixers (figure 1 Blocks 10 and 12 column 2 line 61 to column 3 line 41). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain an output signals of the dual delay lines out of phase with the input signal (Hamamoto column 3 lines 3-7). Therefore, it would have been obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 17.

As per claim 20, Beard discloses a mixing an in-phase (I) component of a communications signal received at an RF input port of an I-channel mixer with an in-phase reference signal received at a reference input of said I-channel mixer (figure 1 Block 10 column 2 line 61 to column 3 line 41); mixing a quadrature (Q) component of said communications signal received at an RF input of a Q-channel mixer with a quadrature reference signal received at a reference input of said Q-channel mixer (figure 1 Block 12 column 2 line 61 to column 3 line 41); generating an error signal from I-channel and Q-channel outputs of said I-channel and Q-channel mixers (figure 1 Block

18 column 2 line 61 to column 3 line 41); and based on a value of the generated error signal, adjusting a relative delay between said in-phase and quadrature reference signals results in quadrature alignment of said in-phase and quadrature components of said communications signal (figure 1 Block 16 column 2 line 61 to column 3 line 41). Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc). Beard doesn't disclose using an adjustable dual delay line in order to alter relative delay between two signals. Hamamoto discloses using an adjustable dual delay line in order to alter relative delay between two signals (figures 8 and 25 column 11 line 65 to column 12 line 56; and column 3 lines 22-62). Beard and Hamamoto are reasonable pertinent to the particular problem with which the applicant is concern. Changing the phase of a periodic signal in 90 degrees is the same than delaying the signal T/4; 180 degrees is the same than delaying the signal T/2, etc. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver disclosed by Beard the dual delay line disclosed by Hamamoto. The suggestion/motivation for doing so would have been to obtain internal clocks with low phase error (Hamamoto abstract). Therefore, it would have been obvious to combine Beard with Hamamoto to obtain the invention as specified in claim 20.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Beard and Hamamoto as applied to claim 6 above in view of Kumar (US 5835850). Beard and Hamamoto disclose claim 6. Beard and Hamamoto don't disclose the use of Gilbert-cell mixers for performing frequency down-conversion. Kumar discloses the use of Gilbert-

cell mixer to make frequency down-conversions in a receiver (column 5 lines 13-16). Beard and Kumar are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Beard and Hamamoto the Gilbert-cell mixer disclosed by Kumar. The suggestion/motivation for doing so would have been to use a low noise high intercept input mixer (Kumar column 5 lines 6-22). Therefore, it would have been obvious to combine Beard and Hamamoto with Kumar to obtain the invention as specified in claim 11.

Claims 12 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beard and Hamamoto as applied to claim 6 above in view of Hislop (US 4492960).

As per claim 12 Beard and Hamamoto disclose claim 6. Beard and Hamamoto don't disclose the use of switch-mode mixers for performing frequency down-conversion. Hislop discloses the use of switch-mode mixers convert make frequency down-conversions in a receiver (figure 1 column 2 lines 4-46). Beard and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Beard and Hamamoto with the switch-mode mixers disclosed by Hislop. The suggestion/motivation for doing so would have been to allow the local oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine Beard and Hamamoto with Hislop to obtain the invention as specified in claim 12.

As per claim 18 Beard and Hamamoto disclose claim 15. Beard and Hamamoto don't disclose a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals from said switch driver. Hislop discloses a switch driver configured to receive the I and Q reference signals and generate drive signals; and I and Q switches configured to receive I and Q drive signals from said switch driver (figure 1 column 2 lines 4-46). Beard and Hislop are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Beard and Hamamoto with the switch-mode mixers disclosed by Hislop. The suggestion/motivation for doing so would have been to allow the local oscillator to be used as the transmitter oscillator and also be used as an attenuator or signal modulator (Hislop abstract). Therefore, it would have been obvious to combine Beard and Hamamoto with Hislop to obtain the invention as specified in claim 18.

Claims 13 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beard, Hamamoto and Hislop as applied to claims 12 and 18 above and further in view of Hulkko (US 5734683).

As per claim 13 Beard, Hamamoto and Hislop disclose claim 12. Beard, Hamamoto and Hislop don't disclose the use of local oscillator with a frequency that is a sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Beard, Hislop and Hukko are analogous art because they are from the same field of

endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Beard, Hamamoto and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine Beard, Hamamoto, Hislop with Hukko to obtain the invention as specified in claim 13.

As per claim 19 Beard, Hamamoto and Hislop disclose claim 18. Beard, Hamamoto and Hislop don't disclose the use of local oscillators with a frequency that is a sub-harmonic of the input frequency. Hulkko discloses the use of local oscillators with a frequency that is a sub-harmonic of the input frequency (figures 2-4 column 6 lines 23-34). Beard, Hislop and Hukko are analogous art because they are from the same field of endeavor. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine in the receiver by Beard, Hamamoto and Hislop with the sub-harmonic of the frequency of the communication signal as taught by Hulkko. The suggestion/motivation for doing so would have been to save power when making the design and implementation of the local oscillator and to use over sampling (Hukko column 6 lines 1-8). Therefore, it would have been obvious to combine Beard, Hamamoto, Hislop with Hukko to obtain the invention as specified in claim 19.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Jaffee (US 5761615 A) discloses a first mixer and a local

oscillator operate to convert the received carrier signal to an intermediate signal. The same local oscillator is also used by a digital phase shifter/divider, that comprises a first D type latch and a second D type latch configured as a Johnson counter, that derive two quadrature signals that are used by a pair of second mixers to demodulate the intermediate signal into two quadrature baseband signals.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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